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EXAMINER	
SIANGCHIN, KEVIN	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/866,773	Applicant(s) TAKATSUKA ET AL.	
	Examiner Kevin Siangchin	Art Unit 2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 5-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 May 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *09/24/2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Detailed Action

Specification

Response to Amendments to the Specification

1. The amendments to the Specification, filed September 24, 2004, have been acknowledged. The amendments introduce no new matter.

2. The amendments adequately address the issues raised in the previous Office Action. All pervious objections to the Specification have been overcome.

Objections: Title of the Invention

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claims

Response to Amendments to the Claims

4. The amendments to the Claims, filed September 24, 2004, have been made of record. Claims 1, 3, and 6 have been amended accordingly. Claim 4 has been cancelled. Claims 7 and 8 have been added.

5. The amendment to Claim 3, changing the words "vision data" to "view data", addresses the inconsistencies pointed out in the previous Office Action. All prior objections to the Claims have been overcome.

6. The Applicant has removed all mention of a "milli-wave camera" from Claim 6 and, thereby, overcomes the 35 U.S.C. § 112(2) rejection posed in the previous Office Action.

7. Claims 1-3 and 5-8 are rejected under 35 U.S.C. § 103(a), as discussed below. Claims 1 and 7-8 are objected to because of various informalities.

Response to Arguments and Remarks

8. The Applicant's arguments, filed September 24, 2004 ("Applicant's Remarks", hereinafter), have been fully considered. A brief treatment of those arguments follows.

9. On September 24, 2004, the Applicant submitted a certified translation of the Japanese priority document. Upon review of that document, the Examiner agrees with the Applicant in that all claimed subject matter was previously disclosed therein. The Applicant, therefore, deserves benefit of the claimed foreign priority date.

10. As the Applicant has dutifully pointed out, this date is earlier than the effective dates of both [Yasui02] (*U.S. Patent 6,4883,429* by Yasui et al.) and [Strumolo03] (*U.S. Patent 6,535,242* by Strumolo et al.). In light of this, the following rejections of the original Claims are withdrawn:

1. The 35 U.S.C. § 102(e) rejection of Claim 1, in view of [Yasui02] (cf. previous Office Action, page 3).
2. The 35 U.S.C. § 102(e) rejection of Claims 1 and 5, in view of [Strumolo03] (cf. previous Office Action, pages 5-6)
3. The 35 U.S.C. § 103(a) rejection of Claim 6, in view of the combination of [Strumolo03], [Sarangpani00] (*U.S. Patent 6,055,042* by Sarangpani), [Shoucri99] (*U.S. Patent 5,999,122* by Shoucri et al.), and [Owens00] (K. Owens and L. Matthies. *Passive Night Vision Sensor Comparison For Unmanned Ground Vehicle Stereo Vision Navigation*. IEEE, 2000).

New grounds for the rejection of these claims are presented below. The Applicant's other arguments regarding Claim 1, particularly with respect to the references of [Sato02] (*U.S. Patent 6,445,815* by Sato et al.) and [Hamilton94] (*U.S. Patent 5,296,854* by Hamilton et al.), are moot in view of the new grounds of rejection.

11. On pages 8-9 of the Applicant's Remarks, the Applicant provides a brief listing of case law related to the proper establishment of a *prima facie* case of obviousness. The Applicant has not, however, cited any particular instance of impropriety in the previous Office Action with respect to these cases. The Examiner believes that no statement or proposition of the previous Office Action violates, in any way, the established legal precedent, aside from the Examiner's failure to recognize the foreign priority date of the instant Application.

Objections

12. Claim 1 is objected to because of the following informality. In the amended portion of Claim 1, the Applicant refers to an "integrated vision data generator". Although this is understood to be the same as the "integrated view data generator", the Applicant should use the same terminology throughout the Claims. Therefore, it is requested that the Applicant change "integrated vision data generator" to "integrated view data generator". Similarly, the words "three-dimensional vision data" and "integrated vision data" should be changed to "three-dimensional view data" and "integrated view data", respectively. Appropriate correction is required.

13. Claim 1 and 7 is objected to because of the following informality. The word "on" in the last line of Claim 7 should be changed to "onboard" or "in". Similar changes should be made to Claim 1. A crew generally does not reside on a vehicle. Similar changes should be made to Claim 1. Appropriate correction is required.

14. Claim 8 is objected to because of the following informality. Consider revising the language of Claim 8. It is unclear, in Claim 8, whether the "obstacle data" includes "at least one symbolized and emphasized objects", or the "integrated view data" includes both the "obstacle data" and the "at least one symbolized and emphasized objects". Appropriate correction is required.

Rejections Under 35 U.S.C. § 103(a)

15. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claims 1-3, 5, and 7-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over [Copeland89] (J.W. Copeland, *U.S. Patent 4,805,015*), in view of [Sato02] (K. Sato, *U.S. Patent 6,445,815*), in further view of [Azuma97] (R.T. Azuma, *A Survey of Augmented Reality*, In Presence: Teleoperators and Virtual Environments, August 1997).

17. *The following is in regard to Claim 1.* [Copeland89] discloses an airborne stereoscopic imaging system (i.e. an aircraft with an integrated stereo-vision system – cf. [Copeland89], *Abstract*). The system comprises:

(1.a.) At least one stereo-camera (e.g. sensor pair **(13,14)**, **(A,A′)**, **(B,B′)**, or **(C,C′)**, which generate stereo image pairs **57** and **58** – cf. [Copeland89] Figs. 2-4) installed in the aircraft for taking images of predetermined outside area (the predetermined area is clearly determined by the field-of-view of each of the sensors; see also [Copeland89], *Abstract*).

(1.b.) A stereo-image recognizer for processing a pair of images (e.g. stereo image pairs **57** and **58** – cf. [Copeland89] Fig. 4) taken by the stereo-camera (e.g. sensor pair **(13,14)**, **(A,A′)**, **(B,B′)**, or **(C,C′)** – cf. [Copeland89] Figs. 2-3), to recognize objects that are obstacles (e.g. terrain, passive or active vehicles, or their armament – cf. Figs. 1 and 3) to the front, thus generating obstacle data (cf. [Copeland89] column 4, lines 20-33).

(1.c.) An integrated view data generator for generating integrated view data including three-dimensional (stereoscopic) view data based on the pair of images taken by the stereo-camera and the obstacle data from the stereo-image recognizer (cf. [Copeland89] column 5, lines 64 through column 6, line 8).

(1.d.) An integrated image display (e.g. a helmet-mounted display (HMD) – [Copeland89] column 5, lines 58-66) for displaying the integrated view data as visible images to crew in the vehicle. The HMD of [Copeland89] stereoscopically displays *real* imagery obtained by the stereo cameras, as opposed to virtual, three-dimensional (3D) imagery.

However, [Copeland89] does not explicitly show or suggest that:

(1.e.) The integrated view data generator is capable of removing 3D view data from the integrated view data.

18. [Sato02] discloses an *augmented reality* ([Sato02] column 1, lines 5-12) presentation system (i.e. an "integrated" vision system) which generates a virtual 3D image of scene from a collection of stereo images, and presents the 3D image to a user ([Sato02], *Abstract*). The system, including the components for inputting the stereo images, comprises:

(1.a$_{Sato}$.) At least one stereo-camera (e.g. cameras **102R** and **102L** in [Sato02] Fig. 16) for taking images (stereo pairs) of predetermined outside area (the predetermined area is clearly determined by the field-of-view of each of the sensors).

(1.b.) A stereo-image recognizer (i.e. the *depth estimation module* **202** of [Sato02] Fig. 16) for processing a pair of images (e.g. stereo image pairs I_R and I_L obtained from cameras **102R** and **102L**, respectively) taken by the stereo-camera (e.g. cameras **102R** and **102L** in [Sato02] Fig. 16), to recognize objects that are obstacles (e.g. objects, such as **400** of [Sato02] Fig. 1, residing in the real environment of the observer; refer to [Sato02] column 1, lines 52-54; also, note that a suggested application of the depth estimation module is collision detection – cf. [Sato02] column 17, lines 39-43) to the front, thus generating obstacle data (i.e. a depth image *ID* – cf. [Sato02] column 5, lines 8-9).

(1.c.) An integrated view data generator (i.e. the *image generation module* **300** coupled with the *three-dimensional CG database* **301** in [Sato02] Fig. 16) for generating integrated view data (i.e. an *augmented reality image* – [Sato02] column 12, lines 46-50), including three-dimensional view data (i.e. CG data of the virtual object – [Sato02] column 12, lines 46-53) based on the pair of images taken by the stereo-camera and the obstacle data from the stereo-image recognizer (i.e. based on the depth image(s) *ID* and *position/posture information* – cf. [Sato02] column 12, lines 44-50).

(1.d$_{Sato}$.) An integrated image display (e.g. a see through head-mounted display (HMD) **100** depicted in [Sato02] Fig. 16) for displaying the integrated view data as visible images to a user.

19. The advantages of augmented reality systems, such as [Sato02], over conventional visualization systems lie in their capability to combine virtual imagery with real imagery. This union of virtual and real imagery enhances a user's visualization of and interaction with his/her physical surroundings. Because real objects are modeled as virtual objects in [Sato02], the system could manipulate, or allow a user to manipulate, objects in the user's visual domain, in a manner that may not have been possible with conventional visualization systems. Furthermore, by rendering the virtual objects (e.g. by CG renderer **302**), the system of [Sato02] inherently gives virtual objects a

visual prominence within the user's visual domain, thereby, distinguishing virtual objects from the *real* objects of scene. This would be of particular use in collision detection applications, especially those involving a vehicle (cf. [Sato02] column 17, lines 39-43). Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the Applicant's claimed invention, to use the see-through HMD (STHMD) and augmented reality system of [Sato02], in lieu of the simple stereoscopic display system of [Copeland89].

20. Although not shown explicitly in [Sato02], augmented reality systems have the ability to remove 3D view data from the virtual, 3D imagery (i.e. (1.e.): "...removing 3D view data from the integrated view data"). [Azuma97][1] shows this on page 9, Section 3.1, *Augmentation* (cf. paragraph 1, sentence 1).

21. *The following is in regard to Claim 2.* It is clear from [Copeland89] Fig. 3 that the stereo sensors obtain images from viewpoints which are wider than the visible domain of the pilot. Furthermore, since the baseline of the sensors is substantially wider than the interpupillary separation of the pilot's eyes, the depth perception of the stereo vision system is increased well beyond (i.e. wider than) that of the pilot ([Copeland89] column 4, lines 10-33). In these ways, the stereo images of [Copeland89] provide a "peripheral wide-area view".

22. [Copeland89] further suggests that obstacles, such as terrain or other aircraft, may be present in the visual field of the stereo vision systems ([Copeland89], column 4, lines 26-33). Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the Applicant's claimed invention, to use stereopsis to model obstacles (e.g. terrain) in the "peripheral wide-area view" of the aforementioned stereo vision system, according to the teachings of [Sato02]. This would allow the crew member(s) to visualize his/her environment clearly in three dimensions and beyond the limited range of his/her own vision. Providing this capability clearly enhances the crew member's situational awareness, thereby, facilitating the crew member's response to approaching obstacles.

23. The modeled obstacles constitute "peripheral wide-area view data". In accordance with [Sato02], these modeled obstacles would be displayed as virtual objects in the STHMD – that is:

(2.) The integrated view data generator adds peripheral wide-area view data to the three-

1 [Azuma97] surveys of the field of Augmented Reality, and, therefore, provides the reader with a general overview of the state of the art, prior to the time of the Applicant's invention. Notice the cited teaching of [Azuma97] applies to augmented reality systems, in general. It can be assumed, therefore, that this feature would have been inherent to the augmented reality system of [Sato02].

dimensional view data.

24. *The following is in regard to Claim 3.* As discussed above, [Sato02] discloses:

(3.) A head mount display (e.g. the aforementioned see-through-type HMD) for overlapping the visible images of the integrated view data and actual view.

See-through-type HMDs operate by rendering computer graphics on a transparent display, while leaving visible the residual portions of user's visual domain (cf. [Sato02] column 1, paragraph 1, sentence 1; [Azuma97] page 10, Section 3.2: *Optical vs. Stereo*, paragraph 2). Other augmented reality systems overlay rendered virtual models over real video feeds (cf. [Sato02] column 16, lines 52-61; cf. *video see-through HMDs* – [Azuma97] page 11, paragraph 1).

25. *The following is in regard to Claim 5.* [Copeland89] suggests that the sensor pairs **(13,14)**, **(A,A′)**, **(B,B′)**, and **(C,C′)** may be infrared (IR) cameras ([Copeland89] column 5, lines 49-51) – that is,

(5.) The stereo-camera includes two infrared cameras. As with all stereo vision systems, the stereo sensors are separated from each other by a distance corresponding to a specific baseline.

Given this, it would have been obvious to one of ordinary skill in the art, at the time of the Applicant's claimed invention to use IR cameras for obtaining stereo pairs consisting of IR spectrum images. IR cameras are capable of detecting objects at night or when obscured by shadows. Therefore, the proposed modification of [Copeland89] would result in a vision system capable of viewing objects in the dark.

26. *The following is in regard to Claim 7-8.* As shown above, both [Copeland89] and [Sato02] disclose:

(7.a.) At least one stereo-camera installed in the aircraft for taking images of predetermined outside area.

(7.b.) A stereo-image recognizer for processing a pair of images taken by the stereo-camera to recognize objects that are obstacles.

27. [Sato02] generates 3D, virtual objects through the analysis of stereo image pairs. These virtual or "symbolized" objects are rendered on the STHMD. As computer graphical images, the virtual objects would be emphasized with respect to the actual views of the user's environment. Therefore, [Sato02] teaches:

> (7.c.) An integrated view data generator for generating integrated view, including 3D view data, based on pair of images taken by the stereo-camera and the obstacle data, including at least one symbolized and emphasized obstacles from the stereo-image recognizer.

or, more simply:

> (8.c.) An integrated view data generator for generating integrated view, including the obstacle data, including at least one symbolized and emphasized obstacles from the stereo-image recognizer.

28. As discussed above, [Copeland89] discloses:

> (7.d.) An integrated image display for displaying the integrated view data as visible images to crew in the vehicle.

Furthermore, the STHMD of [Sato02] superimposes virtual objects over the direct view of a user's (crew's) physical surroundings. If, as suggested above, such an STHMD were to be integrated into the system of [Copeland89], then the user would be able to peer through the STHMD toward the environment outside of the aircraft's cockpit. In that sense,

> (8.d.) The integrated image display (i.e. the STHMD) displays the integrated view data as visible images by overlapping with an actual view from a cockpit.

29. Claims 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over [Copeland89], [Sato02], and [Azuma97], as applied above with respect to Claim 1, in further view of [Sarangapani00] (J. Sarangapani, *U.S. Patent 6,055,042*) and [Owens00] (K. Owens and L. Matthies, *Passive Night Vision Sensor Comparison for Unmanned Ground Vehicle Stereo Vision Navigation*, IEEE International Conference on Robotics and Automation, April 2000) .

30. *The following is in regard to Claim 6.* [Copeland89] suggests the use of several different types of stereo sensors (cameras). These include, for example, digital video cameras, infrared cameras, radar receivers, and sonar ([Copeland89] column 5, lines 49-52). However, [Copeland89] does not show or suggest using these sensors together, in an alternating fashion, which is contingent upon the "actual views".

31. [Sarangapani00] discloses a method for detecting obstacles using multiple sensors, comprising:

(6.a$_{Sarangapani}$.) Using multiple sensors ([Sarangapani00] column 2, lines 5-11 and Fig. 8, step **802**). As disclosed in [Sarangapani00], these sensors can include, but are not limited to, radar scanners, sonar scanners, laser scanners, optical cameras, and infrared (IR) cameras ([Sarangapani00] column 3, lines 28-30).

(6.b$_{Sarangapani}$.) Selectively using the sensors in accordance with the actual views (cf. [Sarangapani00] Fig. 8). [Sarangapani00] assigns a weight to each sensor based on observed environmental *parameters* ([Sarangapani00] column 3, line 61 through column 4, lines 32 and column 5, line 66 through column 6, line 17). For example, one parameter could be the amount of ambient light observed. In conditions of low ambient light (e.g. night, fog dust, etc.), for instance, low weighting factors are assigned to sensors which are sensitive to the amount of ambient light. On the other hand, a larger weight is assigned to sensors which are not affected by the amount of ambient light. The weights could, for example, take on values between 0 and 1. In this case, under low light conditions, the weight of an optical sensor would approach 0, whereas less sensitive sensors, like IR or radar, would receive a weight closer to 1. Effectively, a sensor is selected in accordance with the observed environmental conditions, and its known amenability to such conditions (as reflected by its assigned weight). Conditions, such as ambient light, relate to the "actual view".

It would have been obvious to one of ordinary skill in the art, at the time of the Applicant's claimed invention, modify the aforementioned combination of [Copeland89], [Sato02], and [Azuma97] to use several types of sensor technologies. Clearly, the benefit of using several different sensor technologies is that it would permit the observation of the environment in varying environmental conditions. With respect to the systems of [Copeland89]

and [Sato02], the usage of multiple sensors would allow obstacles to be observed in stereo, modeled, and displayed to the user, even in unfavorable viewing conditions. Also, provided the teachings of [Sarangapani00], it would have been obvious to one of ordinary skill in the art, at the time of the Applicant's claimed invention, to utilize these sensors selectively in accordance with the observed environmental conditions (actual view). Using the different sensor technologies in this manner ensures that the most suitable type of sensor is chosen (or, at least, that ineffectual sensors are not used), given the observed environmental conditions.

32. As stated above, the teachings of [Sarangapani00] are not limited to any particular type of sensor technology. [Copeland89], [Sarangapani00], and [Azuma97] (cf. [Azuma97] page 30, Section 5.1, paragraph 1, last two sentences) all suggest the usage of IR sensors, particularly in conditions of low ambient light. In particular, [Copeland89] suggests applying IR sensors to stereo vision. However, neither [Copeland89], [Sato02], [Azuma97], nor [Sarangapani00] suggest the usage of "intensifiers"[2].

33. [Owens00] provides a comparative study of various night vision technologies employed in the authors' stereo-vision navigation system. [Owens00] contemplates using several different types of night vision technologies. These include the four major groups of commercial-off-the-shelf (COTS) night vision technologies: 3-5 micron cooled Indium Antimonide (InSb), (2) 8-12 micron cooled Mercury Cadmium Telluride (MCT) and 8-12 micron cooled GaAs Quantum Well Infrared Photodetectors (QWIP), (3) 8- 12 micron uncooled microbolometers and pyroelectric detectors and (4) *third generation image intensifiers* ([Owens00] page 123, Section 2.0: *Stereo Disparity Error Analysis*, paragraph 1).

34. Since image intensifiers are a well-known night vision technology, and given their demonstrated usage in stereo-vision systems such as that of [Owens00], it would have been obvious to one of ordinary skill in the art, at the time of the Applicant's claimed invention to use image intensifiers as one of the multiple sensor technologies in the aforesaid combination of [Copeland89], [Sato02], [Azuma97], and [Sarangapani00]. As just stated, image intensifiers are useful in night vision. Image intensifiers and IR sensors detect light from different portions of the electromagnetic spectrum. Image intensifiers are attuned to the visible and near-infrared regions of the electromagnetic spectrum, whereas the cooled and uncooled FLIR sensors in [Owens00] operate in the thermal

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2 An "intensifier" will be interpreted, herein, as an image intensifier, such as those used in night-vision devices.

range of the IR spectrum. Because thermal IR sensors detect emitted thermal radiation, they are less susceptible than image intensifiers (which detect the visible and near-IR radiation reflected from an object) to obscuration due to fog, smoke, dust, etc. Thermal imagers can also detect objects at further distances than image intensifiers. However, thermal imagers generally lack the resolution of image intensifiers. Therefore, image intensifiers and IR sensors can be used in a complementary fashion. Image intensifiers would be preferable in clear, low-light situations. Thermal IR sensors, on the other hand, could be used in instances when image intensifiers may fail, such as in conditions of fog, smoke, dust, or when objects are located at distances outside the range of an image intensifier[3]. The presence of fog, smoke, dust, etc. and the distance of an object could all be treated as environmental parameters in accordance with [Sarangapani00]. Selection between the sensors could be effected according to the methodology prescribed in [Sarangapani00].

Citation of Relevant Prior Art

35. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

36. [Shoucri95] and [Shoucri99] discuss millimeter wave (MMW) imaging in airborne vehicle applications. They discuss the advantages of this imaging technology in situations of low-visibility due to poor weather conditions. [Shoucri95] suggests the fusion of MMW with other images, such as IR images and visible images.

[Shoucri95] M. Shoucri et al. *Passive Millimeter Wave Camera for Aircraft Landing in Low Visibility Conditions*. IEEE AES Systems Magazine, May 1995.

[Shoucri99] M. Shoucri et al. *U.S. Patent 5,999,122: Millimeter Wave Instant Photographic Camera*. Filing Date: June 1998.

3 Object distance is another environmental parameter [Sarangapani00] (i.e. near-range/far-range – cf. [Sarangapani00] Fig. 8, step **806**) suggests using when assigning a weight to a sensor.

37. [Kraemer96] discloses a see-through head mounted display capable of displaying augmented reality imagery which may include images obtained from forward-looking IR (FLIR), low-light television, or other night-vision technologies.

[Kraemer96] W. Kraemer. *U.S. Patent 5,581,271: Head Mounted Visual Display*. Filing Date: December 1995.

38. [Tsuchiya96] discloses a stereo imaging system for use in an automobile. The stereo imaging system detects obstacles and generates three-dimensional data corresponding to those obstacles. This three-dimensional data is displayed to the driver.

[Tsuchiya96] H. Tsuchiya et al. *U.S. Patent 5,530,420: Running Guide Apparatus For Vehicle Capable Of Keeping Safety At Passing Through Narrow Path and the Method Thereof.* Filing Date: December 1994.

39. [Bhanu92] discloses an object detection system for aviation applications. The system uses stereo images obtained from FLIR and video cameras to construct a depth image of the detected objects. [Bhanu92] augments this information by selectively utilizing data obtained from active sensors, such as MMW.

[Bhanu92] B. Bhanu et al. *U.S. Patent 5,128,874: Inertial Navigation Sensor Integrated Obstacle Detection System*. Filing Date: January 1990.

40. [Louis99] and [Legille78] teach that terrain models can be obtained from stereo vision (e.g. [Legille78] column 2, paragraph 2). [Louis99] discloses a method for generating these models from stereoscopic aerial or satellite images.

[Louis99] C. Louis et al. *U.S. Patent 5,974,170: Inertial Navigation Sensor Integrated Obstacle Detection System*. Filing Date: March 1998.

[Legille78] E. Legille. *U.S. Patent 4,110,617: Infra-red Profilometer*. Filing Date: March 1977.

41. [Zander00] teaches the collision detection method involving the selective usage of different types of sensors according to external conditions.

[Zander00] A. Zander et al. *U.S. Patent 6,037,860: Method and Arrangement for Avoiding and/or Minimizing Vehicle Collisions in Road Traffic*. Filing Date: September 1999.

42. Addition relevant literature from the authors of [Owens00].

[Matthies95] L. Matthies et al. *Obstacle Detection For Unmanned Ground Vehicles: A Progress Report*. Proceedings of the Intelligent Vehicles '95 Symposium. September 1995.

[Matthies98] L. Matthies et al. *Performance Evaluation Of UGV Obstacle Detection With CCD/FLIR Stereo Vision And LADAR*. Proceedings of the 1998 IEEE International Symposium on Intelligent Control (ISIC), 1998.

43. [Hosaka01] discloses an aircraft landing system which uses MMW for detecting an incoming aircraft at long distances and during inclement weather conditions. A secondary stereo camera system tracks the vehicle as it approaches the vicinity of the landing system.

[Hosaka01] N. Hosaka et al. *U.S. Patent 6,181,271: Target Approaching System and Approach Guidance System.* Filing Date: August 1998.

44. [Kershner98] discloses an augmented reality system for use in military aircraft. The system identifies a three-dimensional threat envelop and displays this information on an HMD worn by the pilot. The system also displays 3D digital terrains which are derived from an onboard terrain database. The database contains topological data and information with respect to terrain proximal to the flight path.

[Kershner98] S.D. Kershner et al. *U.S. Patent 5,838,262: Aircraft Virtual Image Display System and Method for Providing Real-Time Perspective Threat Coverage Display.* Filing Date: December 1996.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Siangchin whose telephone number is (703)305-7569. The examiner can normally be reached on 9:00am - 5:30pm, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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